Biodiversity and Habitat Conservation

INTRODUCTION

Forested ecosystems in Washington are diverse, from the rainforests of the Olympic Peninsula to the dry ponderosa pine forests of eastern Washington. These forests support a significant portion of Washington's biodiversity, including many species and ecosystems that are of conservation concern.

The most obvious and significant threat to forested ecosystems and the species that they support is outright loss of forest through conversion to other land uses, including residential, commercial, industrial and agricultural. However, our forests also are threatened by fragmentation and degradation. The human footprint (development, transportation corridors, timber harvest, etc.) has fragmented the landscape of remaining forests and altered ecosystem processes (such as the rate, frequency and severity of natural fire and disease), and wildlife movement. With increased 'edges' to habitats in these forest landscapes, and exposure to non-native species, remaining fragments are degraded by weed invasions and non-native animals. Retaining intact, forested ecosystems is critical to the long-term survival of their component species.

CONDITIONS & TRENDS

The following discussion addresses three key components of biodiversity: ecosystems (i.e., assemblages of native species within specific physical environments), ecosystem processes, and species that depend upon the particular habitats within the ecosystem.

Ecosystems and Ecosystem Processes

Many of Washington's ecosystems have undergone significant declines in the last 100-to-150 years, including forested ecosystems. The declines have been primarily the result of direct loss due to conversion to other land uses; habitat fragmentation, which has influenced wildfire, wildlife movement across the landscape and other natural processes; and management practices, such as timber harvest and fire suppression.

Ecosystem processes, including natural disturbances, are critical for the maintenance of healthy, functioning ecosystems. These processes help create the mosaic pattern of early, mid and late- successional stages of individual ecosystem types. As human activities have disrupted these processes, they have affected the current status and future trends of ecosystems and their component plant, fungal, fish and wildlife species. Harvest of old-growth forests, the practice of aggressive fire suppression, and the fragmentation of forests all have impacted these processes.

Old-Growth and Forest Structure

It is estimated that between two-thirds and 87 percent of historical old growth in Washington has been harvested (Booth 1991; Washington State Office of Financial Management [OFM] 1999). Southwestern Washington and the Puget Sound lowlands (collectively, the Puget Trough) experienced the greatest losses of old growth forest because the trees were easy to access and predominantly on private land. Additionally, harvest of old growth continued on state and federal lands through the 1980s. Finally, more than one million acres of Washington's forestlands, predominantly in the Puget lowlands, has been lost in the last two decades to development (OFM 1999). Modern forest management in the last decade has caused the naturally occurring forest stands with a mix of species to be replaced by single-species plantations. Intensive management also has resulted in a significant decrease in important habitat structures such as downed wood and standing snags necessary for wildlife habitat and ecosystem processes (Washington Biodiversity Council 2007a).

The distribution of forest stands of different ages is one way to measure the diversity of forest conditions, habitats and structure on the landscape. In western Washington, about 75 percent of forest lands are younger than 100-years old (Figure 1). About 45 percent are less than 40-years old, which is currently the optimal economic harvest age for intensively-managed commercial forests in which most tress are of the same age. The vast majority of stands more than 100-years in age are on federal forestland, with only 1 percent on non-federal lands. While some estimates of reference conditions have been made for the age distribution within forest stands in eastern Washington (Agee 2003), estimates of historical western Washington forests are not widely established. Prior to Euro-American settlement stand-replacing windstorms in coastal forests and historical fire regimes in drier forests (particularly in eastern Washington) likely created a mosaic of forest stand ages and structures with a far greater proportion of older, late-successional forests than exist today.

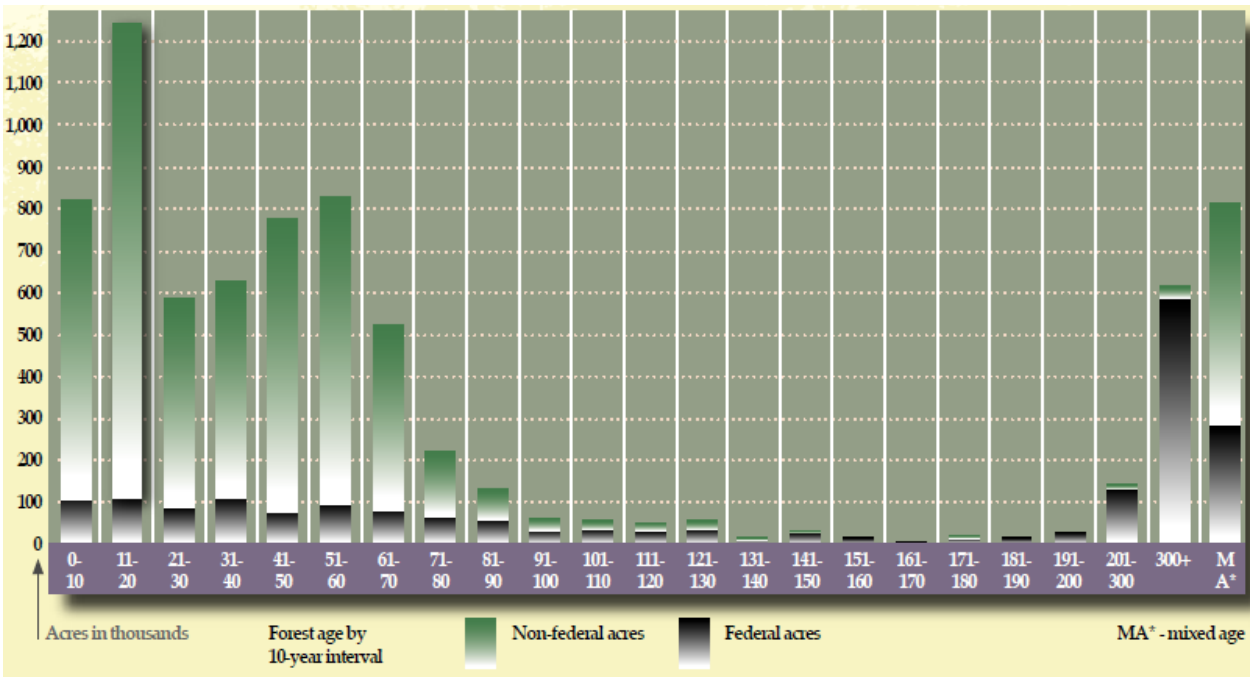

Figure 1. Federal and non-Federal forest age in western Washington, 1992 (DNR 2007)

The application of more modern forest management practices, particularly on state trust lands managed by DNR, has retained legacy tree components and snags that serve as important habitat and take a long time to develop. Commercial timber stands are grown beneath these legacy structures, creating a mixed-age stand. Diversity in the composition of tree species replanted after harvest is also gaining favor over single-species plantations. Finally, new forest practices rules were instituted in 2000 that require a more extensive system of riparian forest buffers along waters and wetlands to protect salmon and riparian-dependent species. Studies are underway by the Forest Practices Cooperative Monitoring Evaluation and Research program to quantify the extent of added benefits for old-forest structure and non-aquatic-dependent biodiversity that are resulting from the rules.

Dry Forest Structure and Wildfire Disturbance Processes

The disruption of the natural fire regime has had an impact on forested ecosystems. We have aggressively put out fires in natural landscapes for many decades. This has shifted the composition of species in these areas away from those that are fire resistant and fire dependent. Forested ecosystems now have stands with more trees per acre, while the species composition of those stands gradually has shifted to include more fire-susceptible species.

Dry forests in eastern Washington are primarily comprised of ponderosa pine and mixed-conifer ecosystems of ponderosa pine, Douglas-fir, western larch, grand fir and

Engelmann spruce. These systems have been significantly changed by timber harvest practices and fire suppression. On the lower elevations of the eastern flank of the Cascades, forests historically were characterized by open stands of large ponderosa pine trees, which are relatively resistant to fire. Douglas-fir, on the other hand, is more susceptible to fire. With diminished fire frequency, Douglas-fir is not eliminated from the stands. Because it is intermediately tolerant of shade, Douglas-fir can persist and grow in the forest understory. Over time, Douglas-fir gains ground, eventually overtopping ponderosa pine and out-competing shade-intolerant pine seedlings. In the last 100 years, overall stand density has increased 307 percent for Douglas-fir, 81 percent for ponderosa pine and 138 percent for Engelmann spruce. Western larch, an important species for its fire- and insect and disease-resistance, decreased in density by 48 percent (Ohlson and Schellhaas, unpublished).

Harvest of the large ponderosa pine trees exacerbated the effects of fire suppression by leaving most of the fire-susceptible trees in place. The end result is that these ecosystems today have a significantly different structure and different species composition. They contain different pathogens, insects, and wildlife than they did historically. One recent study has demonstrated that in many regions of eastern Washington, wildfire-related mortality among large-diameter forests now outpaces their removal through timber harvest (Healy et al. 2008).

One way of measuring the interruption of fire as an ecosystem process is Fire Regime Condition Class (FRCC). FRCC measures the degree of "departure" (low, moderate or high) in present-day vegetation from historical reference conditions. Areas with an FRCC value of 1, or low departure, contain conditions that are historically appropriate and ecologically functional. Areas with an FRCC value of 3, or high departure, stand a significant risk of losing key ecosystem components from unnaturally severe wildfire. In eastern Washington, 6.2 million acres of forestland are at either moderate or high FRCC departure.

Urban Growth and Fragmentation

As urban centers expand, forested ecosystems will continue to be subject to residential and urban development. At greater distances from urban centers, forests will be fragmented by suburban, exurban, and rural development. The movement of more people to rural landscapes will add complexity to fire suppression issues, particularly in eastern Washington where fire frequency, size and severity are typically greater than on the state's Westside.

Plant Communities of Conservation Concern

The number of plant community types that are of conservation concern is, in part, a reflection of these changes on the landscape. The 2009 *State of Washington Natural Heritage Plan* (DNR 2009) identifies 319 plant community types in Washington as

priorities for conservation, of which 176 (>50 percent) are forest types. Of the 176 forest types, 159 are associated with upland forests while 17 are associated with wetland forest. The complete list of plant community priorities maintained by the Washington Natural Heritage Program is available at: http://www1.dnr.wa.gov/nhp/refdesk/plan/CommunityList.pdf.

Biodiversity Conservation Opportunity Framework

The Washington Biodiversity Council, a state-convened group of agency, local government, conservation and industry representatives, generated a framework to guide invest in conservation activities (Washington Biodiversity Council 2007b). Ecoregional assessments – completed as part of a multi-year collaboration between the Washington Department of Fish and Wildlife, Washington State Department of Natural Resources (DNR), The Nature Conservancy, and The Nature Conservancy of Canada – are the best and most recent statewide analysis of Washington's biodiversity. This information includes state agency and conservation data on three commonly accepted measures of biodiversity significance: richness, rarity, and representation. Together these data were used to create a biodiversity significance score on a scale of 1 to 3. Using projections of future population growth and land use, a biodiversity "risk" score was also developed on the same scale. Together, these two measures provide a composite score that represents "conservation opportunity," where areas with both high significance and risk of changes in land use rate highest. Figure 2 displays the results of this analysis, referred to as the Conservation Opportunity Framework.

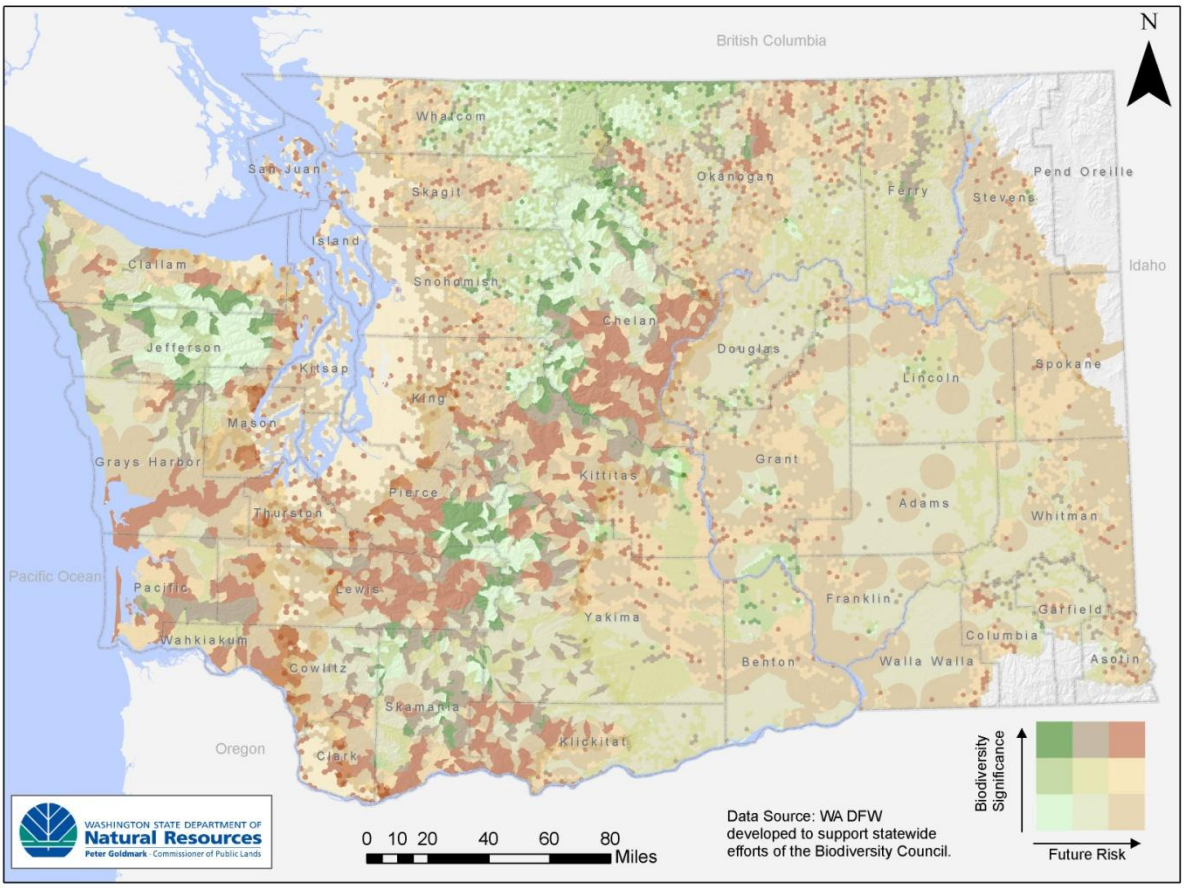

Figure 2. **Assessment of areas with biodiversity conservation opportunity as assessed in the Conservation Opportunity Framework (Washington Biodiversity Council 2007b).**

In the forested environment, the Conservation Opportunity Framework identifies approximately 4.3 million acres of high biodiversity significance and 5.5 million acres of moderate significance. In looking at areas with the greatest conservation opportunity, the Conservation Opportunity Framework identifies 6.3 million acres in the forested environment for which *either* biodiversity significance or risk to biodiversity is rated as high (and the other measure as moderate) or where both measures are rated as high.

Trend 1: Changes in and distribution of forest structure and stand age over time

Trend 2: Prevalence of biodiversity significance in areas where development poses a risk in the forested environment

See **Trend X** in the Working Forestlands section for a measure of forestland converted over time.

See **Trend X** from Wildfire section for a measure of eastern Washington forest lands that exhibit departure from historical fire regimes and conditions using FRCC.

Species

The changes in Washington's landscape over the last 100-150 years have resulted in significant declines for many of Washington's native species, including plants and animals in forested environments. Various state and federal agencies and some conservation organizations maintain lists of species that are of conservation concern; all of these lists continue to grow as landscape changes outpace conservation efforts.

One measure of decline is the number of species listed as endangered or threatened under the federal Endangered Species Act (ESA). According to the U.S. Fish and Wildlife Service Endangered Species website (http://ecos.fws.gov/tess_public/pub/stateListingIndividual.jsp?state=WA&status=listed, accessed on February 25, 2010) there are currently 34 animal species and 10 plant species listed under the federal Endangered Species Act that occur in Washington. The animal species include five mammals and two birds that rely on intact forested environments, as well as 16 fish whose habitats include rivers and streams that run through forested environments. The northern spotted owl (*Strix occidentalis caurina*), marbled murrelet (*Brachyramphus marmoratus*), and 10 evolutionary significant units of salmon (*Oncorhynchus* spp.), five steelhead, and two bull trout are among these federally-listed species. Of the federally listed plant species, three are within forested environments and are potentially affected by the overall health and condition of the forests (*Howellia aquatilis*, *Sidalcea oregana* var. *calva*, and *Hackelia venusta*).

Lists maintained by the Washington Department of Fish and Wildlife (for animals) and by the Natural Heritage Program (for plants) provide a more comprehensive view of the status of Washington's species. The overall number and distribution of species of conservation concern is displayed in Table 1. These species face an uncertain future in Washington State unless they are given special management consideration. Complete lists of species considered of conservation concern by the Washington Natural Heritage Program and the Washington Department of Fish and Wildlife are available on the respective agency websites. The list of Washington's rare plant species with their respective ranks can be found at: http://www.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html. A list of animal species identified in the Comprehensive Wildlife Conservation Strategy can be found at: http://wdfw.wa.gov/wlm/cwcs/ .

Table 1. Distribution of terrestrial species of conservation concern by ecoregion

Ecoregion	Plant Species	Animal Species	Total
Northwest Coast	69	84	153
Puget Trough	56	101	157
North Cascades	36	29	65
West Cascades	36	50	86
East Cascades	87	41	128
Okanogan	68	54	122
Canadian Rockies	38	31	69
Blue Mountains	28	43	71
Columbia Plateau	104	70	174

Note: There is considerable overlap between ecoregions of individual species. The total numbers reflected in this table includes 359 plant species and 179 animal species (not including salmonids). Source: Washington Biodiversity Council (2007a)

With regard to plant species that are of conservation concern, a significant subset occurs within forested environments (not necessarily within forest stands). They include nine state endangered (two of which are federally endangered and two are U. S. Fish and Wildlife Service (USFWS) 'species of concern'), thirty-two state threatened (of which one is 'federally threatened' and seven are USFWS 'species of concern'), fifty-two state sensitive (of which six are USFWS 'species of concern'), and nine species that are under review for potential addition to the listings

Animal species of conservation concern within the forested environment paint a similar picture. Forests provide habitat for ten state endangered, five state threatened, thirty-two state candidate, three state sensitive, and seventeen species that are under review for potential addition.

Salmonids

Fish are an important and focal natural resource with both biodiversity and economic significance in the State of Washington. In particular, Pacific salmon and trout, as well as other fish species, are indicators of a properly functioning aquatic ecosystem because they require cool, clean water, complex channel structures and substrates, and low levels of silt. Properly functioning riparian ecosystems, and the upland conditions that can affect them, are essential to healthy fish runs. In addition, Pacific salmon and trout support economically important commercial and sport fishing industries, as well as subsistence fishing by many Washington Indian Tribes.

Because of their importance, and federal and state listing status, significant efforts and investments have been devoted to conserving Pacific salmon and trout and the contributions they make to maintaining overall biodiversity. Table 2 displays the listed

species and their distribution in Washington State, and Table 3 displays the 1992 and 2002 status of salmonid stocks by region.

Table 2. Federal- and state-listed Pacific salmon, steelhead and trout species in Washington

Species	Population[1/]	Federal Status	State Status	Distribution [2/]
Chum Salmon	Hood Canal Summer–run	Threatened	Candidate	5
Oncorhynchus keta	Columbia River	Threatened	Candidate	3
	Puget Sound—Strait of Georgia	Species of Concern	None	1, 4-7
Coho Salmon	Lower Columbia River	Candidate	None	3
O. kisutch	Southwest Washington	Species of Concern	None	2
Sockeye Salmon	Snake River	Endangered	Candidate	12
O. nerka	Ozette Lake	Threatened	Candidate	1
	Snake R. Fall-run	Threatened	Candidate	12
	Snake R. Spring/Summer-run	Threatened	Candidate	12
Chinook Salmon	Puget Sound	Threatened	Candidate	4, 5, 7
O. tshawytscha	Lower Columbia River	Threatened	Candidate	3, 9
	Upper Willamette R.	Threatened	Candidate	9
	Upper Columbia River Spring-run	Endangered	Candidate	8
	Upper Columbia River	Endangered	Candidate	8
	Snake River	Threatened	Candidate	12
Steelhead Trout	Lower Columbia River	Threatened	Candidate	3,9
O. mykiss	Upper Willamette	Threatened	Candidate	9
	Middle Columbia River	Threatened	Candidate	9
Bull Trout	Columbia River	Threatened	Candidate	3, 8-10, 12
Salvelinus confluentus	Coastal - Puget Sound	Threatened	Candidate	1, 2, 4, 5, 7

1/ Populations of Pacific salmon are designated as Evolutionarily Significant Units (ESU) by NMFS. The USFWS designates threatened and endangered population segments as Distinct Population Segments (DPS).

2/ Numbers indicate EIS Regions where species occurs. Region: 1 = Olympic Coast; 2 = Southwest; 3 = Lower Columbia; 4 = South Puget Sound; 5 = West Puget Sound; 6 = Islands; 7 = North Puget Sound; 8 = Upper Columbia (downstream Grand Coulee); 9 = Mid Columbia; 10 = Upper Columbia (upstream Grand Coulee); 11 = Columbia Basin; 12 = Snake River.

Table 3. Status of salmonid stocks in Puget Sound, Pacific Coast and Columbia River in Washington. (WDFW Salmonid Stock Inventory, 2002)

PUGET SOUND				
	1992		2002	
North Sound	**No. of stocks**	**Percent of stocks**	**No. of stocks**	**Percent of stocks**
Healthy stocks	27	38%	25	38%
Depressed stocks	12	17%	15	23%
Critical stocks	4	6%	2	2%
Extinct stocks	0	0%	0	0%
Not Rated stocks	Not applicable		0	0%
Unknown stocks	28	39%	24	36%
Total	71		66	
	1992		2002	
South Sound	**No. of stocks**	**Percent of stocks**	**No. of stocks**	**Percent of stocks**
Healthy stocks	40	65%	28	47%
Depressed stocks	7	11%	14	23%
Critical stocks	1	2%	3	5%
Extinct stocks	1	2%	1	2%
Not Rated stocks	Not applicable		2	3%
Unknown stocks	13	21%	12	20%
Total	62		60	
	1992		2002	
Hood Canal	**No. of stocks**	**Percent of stocks**	**No. of stocks**	**Percent of stocks**
Healthy stocks	17	47%	17	36%
Depressed stocks	11	31%	14	30%
Critical stocks	1	3%	2	4%
Extinct stocks	0	0%	6	13%
Not Rated stocks	Not applicable		0	0%
Unknown stocks	7	20%	8	17%
Total	36		47	
	1992		2002	
Strait of Juan de Fuca	**No. of stocks**	**Percent of stocks**	**No. of stocks**	**Percent of stocks**
Healthy stocks	9	23%	11	26%
Depressed stocks	14	35%	9	21%
Critical stocks	5	13%	5	12%
Extinct stocks	0	0%	1	2 %
Not Rated stocks	Not applicable		0	0%
Unknown stocks	12	30%	16	38%
Total	40		42	
	1992		2002	
Puget Sound Total	**No. of stocks**	**Percent of stocks**	**No. of stocks**	**Percent of stocks**
Healthy stocks	93	45%	81	38%
Depressed stocks	44	21%	52	24%
Critical stocks	11	5%	12	6%
Extinct stocks	1	<1%	8	4%
Not Rated stocks	Not Applicable		2	<1%
Unknown stocks	60	29%	60	28%
Total	208		215	

COAST				
	1992		2002	
North Coast	No. of stocks	Percent of stocks	No. of stocks	Percent of stocks
Healthy stocks	35	49%	31	45%
Depressed stocks	4	6%	3	4%
Critical stocks	0	0%	1	2%
Extinct stocks	0	0%	0	0%
Not Rated stocks	Not applicable		0	0%
Unknown stocks	33	46%	34	49%
Total	72		69	
	1992		2002	
South Coast	No. of stocks	Percent of stocks	No. of stocks	Percent of stocks
Healthy stocks	30	70%	32	65%
Depressed stocks	4	9%	10	20%
Critical stocks	0	0%	0	0%
Extinct stocks	0	0%	0	0%
Not Rated stocks	Not applicable		0	0%
Unknown stocks	9	21%	7	14%
Total	43		49	
	1992		2002	
Coast Total	No. of stocks	Percent of stocks	No. of stocks	Percent of stocks
Healthy stocks	65	57%	63	53%
Depressed stocks	8	7%	13	11%
Critical stocks	0	0%	1	<1%
Extinct stocks	0	0%	0	0%
Not Rated stocks	Not applicable		0	0%
Unknown stocks	42	37%	41	35%
Total	115		118	

COLUMBIA RIVER				
	1992		2002	
Lower Columbia	No. of stocks	Percent of stocks	No. of stocks	Percent of stocks
Healthy stocks	19	29%	10	15%
Depressed stocks	40	61%	29	43%
Critical stocks	0	0%	1	2%
Extinct stocks	0	0%	0	0%
Not Rated stocks	1	2%	0	0%
Unknown stocks	6	9%	25	38%
Total	66		65	
	1992		2002	
Mid-Columbia	No. of stocks	Percent of stocks	No. of stocks	Percent of stocks
Healthy stocks	5	33%	5	28%
Depressed stocks	7	47%	6	33%
Critical stocks	0	0%	0	0%
Extinct stocks	0	0%	0	0%
Not Rated stocks	0	0%	0	0%
Unknown stocks	3	20%	7	39%
Total	15		18	
	1992	1992	2002	2002
Snake River	No. of stocks	% of stocks	No. of stocks	% of stocks
Healthy stocks	0	0%	0	0%
Depressed stocks	5	83%	4	67%
Critical stocks	1	17%	0	0%
Extinct stocks	0	0%	1	17%
Not Rated stocks	0	0%	0	0%
Unknown stocks	0	0%	1	17%
Total	6		6	
	1992		2002	
Upper Columbia	No. of stocks	Percent of stocks	No. of stocks	Percent of stocks
Healthy stocks	6	33%	3	17%
Depressed stocks	12	67%	6	33%
Critical stocks	0	0%	7	39%
Extinct stocks	0	0%	0	0%
Not Rated stocks	0	0%	0	0%
Unknown stocks	0	0%	2	11%
Total	18		18	
	1992		2002	
Columbia River Total	No. of stocks	Percent of stocks	No. of stocks	Percent of stocks
Healthy stocks	29	26%	18	17%
Depressed stocks	70	63%	45	42%
Critical stocks	1	<1%	8	7%
Extinct stocks	0	0%	1	1%
Not Rated stocks	Not applicable		0	0%
Unknown stocks	11	10%	35	33%
Total	111		107	

Trend 3: Number of animal and plant species of conservation concern in Washington occurring within the forested environment

Trend 4: Population status of salmon, steelhead and bull trout stocks

THREATS & OPPORTUNITIES

As noted above, the primary threats to Washington's forested ecosystems, and the biodiversity supported by those ecosystems, are associated with habitat conversion, fragmentation, and degradation.

▶ Threat: Habitat Fragmentation

A significant portion of the state's original forested environment has been converted since statehood in 1889. Much of what remains occurs as isolated fragments within a mosaic of a variety of land uses. The fragmentation interrupts natural ecosystem processes, such as fire, disease and predation, to varying degrees. Wildlife movement patterns and migration routes may be blocked or altered, resulting in isolation from other breeding populations. According to the Washington Department of Fish and Wildlife, 30,000 to 80,000 acres of functional habitat for wildlife are lost or altered every year (Comprehensive Wildlife Conservation Strategy). These impacts are felt most severely in lowland western Washington, where the footprint of the human population continues to expand. However, forests within daily commuting distance of all of the state's larger towns and cities are experiencing conversion to housing development and other land uses.

Opportunities: Identify and protect priority wildlife habitats; Reduce the rate of forest conversion; and Identify and protect and/or restore critical landscape linkages for species movement.

▶ Threat: Altered Fire Regimes

Fire suppression is one key factor contributing to changing conditions within forested ecosystems, particularly east of the Cascade crest. The challenge is, in part, how to maintain the full range of seral conditions distributed across the landscape in such a way that the full complement of species and ecosystems can be sustained. Many plant species evolved in the presence of fire and require periodic burning (e.g., for seed germination or for maintaining appropriate sunlight conditions for growth and development). In the absence of fire, these species have declined and the species that replaced them are less well-adapted to the environment. Shifts in species composition and increasing forest density are contributing to more frequent severe fire events than are historically expected, and in turn these events are causing the loss of important biodiversity features, such as large fire-resistant trees and snags.

Opportunities: Restore ecologically appropriate tree species and the large tree component of currently overstocked eastern Washington forests; use prescribed fire to restore and maintain fire-resistant stand conditions; and maintain stocks of genetically appropriate tree species so that species composition can be restored

▶ Threat: Invasive Non-native Species

Invasive, non-native plants and animals are of increasing concern in Washington. They outcompete and displace our native species, profoundly changing natural ecosystems. They evolved in other parts of the world but arrived in Washington without the natural predators or diseases that controlled their growth in their native environments. This is not only a problem for native plants and animals, but for Washington's agricultural industries as well.

Opportunities: Early detection and eradication of exotic species

▶ Threat: Climate Change

Climate change is expected to have significant impacts on ecological processes and species' distribution patterns. An overview of the issues and some of the potential impacts of climate change are provided in a report prepared by Lawler and Mathias (2007) for the Washington Biodiversity Council (see http://www.biodiversity.wa.gov/documents/WA-Climate-BiodiversityReport.pdf). With regard to forested ecosystems, they anticipate the greatest changes occurring at current forest boundaries, where seedling establishment is limited by cold temperatures (upper elevations) or dry conditions (lower elevations on the east slope of the Cascades). Forests may expand or contract based on regional or local changes in temperature and moisture availability. Lawler and Mathias also anticipate that increasing temperatures will lead to drier fuels which, in turn, will lead to more frequent, intense and, possibly, larger wildfires.

A number of efforts are underway to better understand the potential impacts of climate change and to identify strategies to both adapt to and mitigate for climate change. The Washington Department of Fish and Wildlife is currently engaged in a process of adapting the state wildlife action plan to take climate change into account.

Opportunities: Maintain the productivity and carbon sequestration value of forests for climate change mitigation; Assist forest ecosystems with adapting to a changed climate; and Identify, protect and/or restore landscape linkages for species' range shifts in response to climate change.

RELEVANT NATIONAL THEMES AND STRATEGIC OBJECTIVES

Issues concerning critical habitats, species and biodiversity can be addressed by the National Theme "*Enhance public benefits from trees and forests*" from the State and Private Forestry Redesign structure. Specific to these issues are two Strategic Objectives – "*Protect, conserve and enhance wildlife and fish habitat*" and "*Manage and restore trees and forests to mitigate and adapt to global climate change*." There are many linkages between these issues and the other national themes and strategic objectives identified in the State and Private Forestry Redesign.

CURRENT STRATEGIES

A number of different conservation 'strategies' have been implemented in Washington. These strategies include setting statewide priorities for important species, ecosystems, and locations where conservation actions are needed. Many of these strategies, assessments and plans can and will make a direct contribution to the National Themes and their associated management objectives. Some of the higher profile efforts are described below and their contributions to the national themes and associated strategies are identified.

Washington Biodiversity Conservation Strategy

The Washington Biodiversity Council was established by executive order of the Governor in 2004. The Council was charged with developing a biodiversity conservation strategy for the state with a 30-year time frame. The strategy identifies six action recommendations:

1. Guide investments on the ground, using the 'conservation opportunity framework, which provides a statewide map of conservation values and future risks (as indicated by projected human population growth).
2. Make use of, and expand the availability of, incentive programs and conservation markets to encourage investment in high priority landscapes.
3. Incorporate biodiversity conservation priorities into land use planning processes.
4. Establish a comprehensive scientific understanding of Washington's biodiversity and effective conservation practices and make available information readily accessible and useful for land managers and decision makers.
5. Inform, educate, and engage Washingtonians to create an understanding of biodiversity's importance to our quality of life and to build capacity to take action to conserve, care for, and restore ecosystems.
6. Provide leadership, accountability, and funding to ensure successful implementation of the Biodiversity Conservation Strategy.

The State of Washington Natural Heritage Plan

The *Natural Heritage Plan* is updated each biennium. It establishes priorities for species and ecosystems to be targeted for inclusion within the statewide system of natural areas, which includes areas in federal, state and private ownership. The conservation priorities established in the *Natural Heritage Plan* are also widely used outside of the context of natural areas. Conservation organizations, county planning departments and others recognize the Plan's priorities and incorporate them into land-use planning and decision-making. Priorities for species are based on rarity, threats and species' vulnerability. Priorities for ecosystems are based on rarity, size, ecological condition, and landscape context.

Comprehensive Wildlife Conservation Strategy

Washington's *Comprehensive Wildlife Conservation Strategy* was developed by the Washington Department of Fish and Wildlife and approved by the U.S. Fish and Wildlife Service in 2005. It qualifies Washington for an important federal funding source – the State Wildlife Grants program. The strategy identifies six categories of effective conservation action:

1. Identify scientific information for local governments and planners.
2. Enhance and conserve habitat on public, private, and tribal lands and waterways.
3. Implement species conservation strategies and coordinated salmon recovery.
4. Expand wildlife information and conservation education programs.
5. Conduct biological assessments, research, monitoring and surveys of fish, wildlife and habitat.
6. Ensure implementation of local, state, and federal laws to protect fish, wildlife and habitat.

The strategy also identifies three actions to take to implement action plans for each of Washington's nine ecoregions:

1. Determine which species, habitats and landscapes represent the greatest conservation opportunities for each ecoregion.
2. Identify specific actions needed to realize ecoregional conservation opportunities.
3. Activate partnerships; identify conservation roles.

Wildlife Habitat Connectivity Working Group

Habitat connectivity is necessary to meet the needs of wildlife for their daily, seasonal, and dispersal movements. In Washington State a group of state and federal agencies, non-governmental organizations and universities, have joined together to form the Wildlife Habitat Connectivity Working Group to address wildlife connectivity needs; a statewide analysis is the initial task of this organization. The primary product of the statewide analysis will be maps that represent a depiction of landscape features that contribute to unimpeded movements of wildlife throughout Washington and adjacent

areas of Idaho, Oregon and British Columbia. Protecting and restoring landscape features that allow animals to move is essential to ensure the long-term viability of many Pacific Northwest wildlife populations.

In Washington State, at least 34 vertebrate Species of Greatest Conservation Need (WDFW 2005), and 22 additional vertebrate species are considered highly vulnerable to loss of habitat connectivity. *Of these species, approximately one-third are associated with forested environments.*

The connectivity plan is being accomplished with support from the Washington Biodiversity Council, and Washington State Governor's Office, and will have many uses, including use by the Washington State Department of Transportation for safe wildlife passage implementation, by local governments in their comprehensive plans, and by conservation organizations involved in protecting wildlife habitat. The statewide analysis will fulfill a part of Washington State's contribution to the Western Governors' Association Wildlife Corridors Initiative, and is a component of Washington Department of Fish and Wildlife's Wildlife Action Plan.

Washington Wildlife and Recreation Program

The Washington Wildlife and Recreation Program has provided funding for improvement, restoration, and acquisition of 350,000 acres of land since its inception in 1989. In all, $620 million in state funds and $444 million in matching local and federal funds have been leveraged to complete over 1,000 projects over the last 20 years. Many of these projects have been for critical habitats, natural areas, parks, riparian protection and recreation in forested environments. In order to be eligible for acquisition in the Habitat Conservation category, sites must contain species or ecosystems that have been identified as priorities for conservation by either DNR's Natural Heritage Program or the Washington Department of Fish and Wildlife.

Habitat Conservation Plans in Washington State

Habitat Conservation Plans (HCPs) are agreements between the U.S. Fish and Wildlife Service and a landowner in which the landowner agrees to meet specified conservation measures for a federally listed species (or multiple listed species). HCPs essentially give the landowner a level of certainty regarding which land management activities will be appropriate within the habitat of a listed species. They also put in place terms and conditions for 'incidental taking' of a listed species. Twelve forest-related HCPs are in place in Washington, covering more than 11 million acres. The Forest Practices HCP is the largest at 9.1 million acres, and covers aquatic species (for more information on the Forest Practices HCP, see Existing Strategies in the section on Water Quality, Quantity and Puget Sound). Additionally, 1.8 million acres of DNR-managed forest lands are covered by an HCP. A number of private companies have also entered into HCPs.

Forest Certification

Two certification programs have been available in Washington: Sustainable Forestry Initiative (SFI) and Forest Stewardship Council (FSC). Both include standards for biodiversity conservation. DNR has achieved SFI certification for all forested trust lands in the state and FSC certification for forested trust lands within the department's South Puget Planning Unit. In total, this amounts to two million acres of certified DNR-managed land. In Washington State, there are currently 4.2 million acres of SFI-certified forest land, and 267,000 acres of FSC-certified forest land.

Other Public/Private Partnerships

Private conservation organizations and public agencies have collaborated on various conservation projects in Washington. Two examples are the Mountains to Sound Greenway and the Tapash Sustainable Forest Collaborative. The Greenway seeks to conserve and enhance the landscape along the 100-mile stretch from Seattle across the Cascade Mountains to Central Washington and ensuring a long-term balance between people and nature. The organization achieves that goal by promoting land acquisition for wildlife habitat and working forests, recreational access, restoration, trail planning, building and maintenance, advocacy, outreach and education.

The Tapash Sustainable Forest Collaborative is a partnership of the USDA Forest Service, Washington Department of Fish and Wildlife, DNR, The Nature Conservancy, Yakama Nation Indian Tribe, Washington counties, and many citizens. Formalized in May 2006, the Collaborative's aim is to use a collaborative, cross-ownership approach to restore forest health and protect the forested ecosystems of the eastern Cascades – specifically, thousands of acres in Tieton Canyon – from imminent conversion. For more information on the Tapash Collaborative, see the Existing Strategies section of the Wildfire section of this report.

DATA GAPS

- Initial survey/inventory work for rare species has yet to be done on much of Washington's forested lands, particularly those that are private, tribal, and state owned.
- Production of a wall-to-wall statewide vegetation map, including changes to forest structure over time.
- Information about the impacts of climate change and how species will respond to that change.

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